

Displacement: You want the negative parts to cancel out the positive parts.

$$\text{displacement} = \int_{t=a}^{t=b} v(t) dt$$

because $\int_a^b s'(t) dt = \text{total change in position}$

Distance needs to count every step
I take whether forward or backward.
i.e. "straighten out" my journey.

$$\text{distance} = \int_{t=a}^{t=b} |v(t)| dt$$

or

$$\text{distance} = \left| \int_a^c v(t) dt \right| + \left| \int_c^b v(t) dt \right|$$

in positive direction in negative direction

6.7/15-26

15.

$$a(t) = -2 \quad v = 3 \quad 1 \leq t \leq 4$$

$$\int -2 = -2t$$

$$\cdot 2t + 3 = vt$$

$$-2t + 3 = 0$$

$$-2t = -3 \quad t = \frac{3}{2}$$

$$\int_1^4 |-2t + 3| dt = \int_{\frac{3}{2}}^1 -2t + 3 dt + \int_1^4 2t - 3 dt =$$

$$\left(\frac{3}{2} \right)^2 = \frac{9}{4}$$

$$\frac{3 \times 3}{2} = \frac{9}{2}$$

$$\int_{\frac{3}{2}}^1 -2t + 3 dt = -t^2 + 3t \Big|_{\frac{3}{2}}^1 = \left(-\frac{1}{4} + \frac{9}{2} \right) - 2 = \frac{1}{4}$$

$$\int_1^4 2t - 3 dt = t^2 - 3t \Big|_1^4 = \left(\frac{9}{4} - \frac{9}{2} \right) - \left(\frac{1}{4} - 3 \right) = -\frac{9}{4} - \frac{1}{4} + 12 = 11 - \frac{10}{4} = 11 - \frac{5}{2} = \frac{22}{2} - \frac{5}{2} = \frac{17}{2}$$

$$\frac{1}{4} + \frac{17}{2} = \frac{1}{4} + \frac{34}{4} = \frac{35}{4}$$

$$\frac{35}{4} = 8.75$$

$$\int_1^4 -2 dt = -2t \Big|_1^4 = -8 + 2 = -6$$

$$\int_1^4 (-2t + 3) dt = -t^2 + 3t \Big|_1^4 = (-16 + 12) - (-1 + 3) = -4 - 2 = -6$$

$$\frac{35}{4} - 6 = \frac{35}{4} - \frac{24}{4} = \frac{11}{4} = 2.75$$

6.7/17) ~~Q~~ $a(t) = \frac{1}{\sqrt{5t+1}}$; $v_0 = 2$ $[0, 3]$

$$a(t) = (5t+1)^{-\frac{1}{2}}$$

$$v(t) = \int (5t+1)^{-\frac{1}{2}} dt = \frac{1}{5} \int u^{-\frac{1}{2}} du = \frac{2}{5} u^{\frac{1}{2}} + C$$

$$u = 5t+1$$

$$du = 5dt$$

$$\frac{1}{5} du = dt$$

$$= \frac{2}{5} (5t+1)^{\frac{1}{2}} + 2$$

so $v(t) = \frac{2}{5} (5t+1)^{\frac{1}{2}} + 2$

displacement = $\int_0^3 \left(\frac{2}{5} (5t+1)^{\frac{1}{2}} + 2 \right) dt$

$u = 5t+1$
 $\frac{1}{5} du = dt$ like above...

$$\text{displacement} = \left(\frac{4}{15} (5t+1)^{\frac{3}{2}} + 2t \right) \Big|_0^3$$

$$= \frac{4}{15} (64+6) - \frac{4}{15} (1) = \frac{69.4}{15} = \frac{276}{15}$$